

**PROTECTIVE ADAPTATIONS AMONG AQUATIC
HEMIPTERA.**

BY J. R. DE LA TORRE-BUENO, White Plains, N. Y.

Size, form, color, position and behavior are closely linked with the other three protective adaptations among the waterbugs; in fact color at times depends on behavior for its protective efficacy.

The Aquatic Hemiptera naturally divide themselves into the two empirical groups—Cryptocerata and Gymnocerata. The latter may be dismissed briefly as they do not appear to any great extent as prey, but preeminently as predators. Their size, habits and great agility are sufficient protection. It is possible, however, that the smaller forms at least produce repulsive odors. At any rate, in aquaria I have noted larger waterstriders seize *Microveliae* and promptly release them uninjured. *Hydrometra*, owing to its inconspicuous form and to its habit of standing on stems rising out of the water, seems also to be safe from enemies.

It is in the Cryptocerata, mainly deep water dwellers, except Ochteridae and Gelastocoridae, that we find the few real protective adaptations.

Takahashi has pointed out, what I also have repeatedly observed in nature in *Ochterus banksi*, that the nymph of *O. formosanus* carries on its back little grains of sand. *O. banksi* seems to acquire more or less of a muddy coat. In consequence, when these nymphs squat in little holes on the muddy or sandy surfaces on which they congregate, they immediately merge into their surroundings. *O. banksi* seems to be a denizen of black marshes where its own black coat makes it invisible on the dull surface of the black mud, where it crouches motionless in some little pit. *Gelastocoris*, on the other hand, seems to be a denizen of sandy or pebbly beaches. All the known species have the same peculiar mottled shagreened effect. On a sandy flat or beach they merge at once into the surrounding soil. They are so still they look like an inconspicuous lump of sand. Hungerford gives an excellent illustration of a concealed *Gelastocoris* in his *Biology of Aquatic Hemiptera*. The other members of the family Gelastocoridae—*Mononyx*, *Matinus*, *Nerthra*, *Peltopterus*—are either more or less granulose and variegated, or dull and muddy looking. It has been reported that some have been taken concealed in mud, which they quite resemble in color and with which at times we find specimens covered.

The Belostomatidae and Naucoridae in general are of sober dull brown-greens which must harmonize with the underwater aspect of the vegetation, dead leaves, trash and mud among which they hide. *Belostoma flumineum* has been studied by Dr. H. H. Severin who found it exhibited marked death-feigning or cataleptic ability. I have never been able to quite convince myself that this is a protective tropism, since the insect is small, an active swimmer, very ferocious and given to concealment; so outside of its own kind it would seem to have nothing to fear. But its own would take little account of trance, catalepsy or death-feigning, but would indeed profit by it to at least start their meal without a struggle. The larger ones are fierce, strong and active, and endeavor to escape by main force or by attack or threat of attack. In fact, so far as one may judge by aquarium observations, if in danger, Belostomatids seem to place reliance on speed as a means of escape.

Corixidae are generally protectively colored or patterned, so as to be inconspicuous on the bottoms to which they cling by preference. As to Notonectidae, the majority of the species are sufficiently large and brightly colored to be quite conspicuous. The sole exceptions are in the subfamily Pleinae in which the average run of species does not quite equal 3 mm. in length, one *Helotrephes* being barely over 1 mm. These little species crawl about aquatic vegetation, hiding among the leafage or in the crotches of shoots from the main stem, or elsewhere on the plant. In such situations they are quite inconspicuous.

Finally, we come to the only truly mimetic group in the aquatic Hemiptera, the Nepidae. *Nepa* and its allies conceal themselves in mud or under water. *Ranatra*, on the other hand, has certain protective resemblances to little twigs. Its color is generally an inconspicuous brown or grey (which looks dark when wet), its form is narrow and twiglike in effect. Its motions under water are slow and deliberate to a degree. When stalking prey it seems scarcely to move. But it is as quick as light when it strikes. It generally lies concealed among grasses rising out of the water, in places in which there are twigs. When seized, or taken out of its element, it goes into a death-feint, its stiff, ungainly long legs crooked and pointing every which way. It is hard to detect among the rubbish with which it comes into the net.

But always I ask myself the question—What do these sub-aquatic dwellers look like to each other, and to the great fishes, their gigantic enemies? Though, be it said, none except Corixidae become fish food to anything more than a most limited degree.